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Do Informed Citizens Receive More…or Pay More?

The Impact of Radio on the Government Distribution of Public Health Benefits

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Abstract

The government provision of free or subsidized bed nets to combat malaria in Benin allows the identification of new channels through which mass media affect public policy outcomes. Prior research has concluded that governments provide greater private benefits to better-informed individuals. This paper shows, for the first time, that governments can also respond by exploiting informed individuals' greater willingness to pay for these benefits. Using a "natural experiment" in radio markets in northern Benin, the paper finds that media access increases the likelihood that households pay for the bed nets they receive from government, rather than getting them for free. Households more exposed to radio programming on the benefits of bed nets and the hazards of malaria place a higher value on bed nets. Local government officials exercise significant discretion over bed net pricing and respond to higher demand by selling bed nets that they could have distributed for free. Mass media appears to change the private behavior of citizens—in this case, to invest more of their own resources on a public health good (bed nets)—but not their ability to extract greater benefits from government.

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1. Introduction

The take-up and correct usage of anti-mosquito bed nets to prevent malaria are key development issues in Africa and of substantial concern to donors. In order to address behavioral and economic constraints to take-up and correct usage, donor- and government-sponsored bed net distribution programs rely on both pricing strategies (subsidized or free bed nets) and media campaigns. For example, radio broadcasts of health messages is a prominent part of the international Roll Back Malaria program. These programs raise three central questions that are the focus of the analysis here. First, the literature shows that households with greater media access are more likely to receive cash transfers in more established democracies. Does media access also improve household ability to demand non-cash benefits from government in less established democracies? Second, does radio access increase households' adoption of healthy practices? And, third, does it support or undermine the implementation of pricing strategies meant to stimulate the take-up of mosquito bed nets? We examine these questions using original data we collected to exploit a "natural experiment" in radio access in Benin, a country with a large donor-funded government program for the distribution of free bed nets. Analysis of these data demonstrates significant, and surprising, effects of media access.

With regard to the first question, whether radio access affects household ability to demand free bed nets, strong evidence from other parts of the world indicates that governments are more likely to target programs offering private benefits to citizens with better access to mass media, including natural disaster relief in India (Besley and Burgess 2002), and welfare payments during the US Great Depression (Strömberg 2004). The results here, in contrast, show that in an environment with additional barriers to government responsiveness, besides citizens' lack of information, greater access to mass media does not enable citizens to extract more benefits from government programs. As a consequence, and in contrast to prior research, households living in villages with greater radio access report no more, and in some specifications significantly fewer, free bed nets.

On the other hand, radio access does influence household demand for public health goods: households living in villages with greater radio access are more likely to report paying for bed nets rather than receiving them for free. Similar to the findings in Keefer and Khemani (2010), that media access increases household investment in their children's education, we find here that greater radio access shifts private household spending to finance the adoption of healthier practices.

The evidence also reveals a significant effect of media access on the prices that officials charge for government-provided goods and services.[1] Prior research has examined the effects of small changes in prices on both the take-up and intra-household allocation of bed nets, abstracting from the presence of media campaigns to boost household demand (Cohen and Dupas, 2008; Dupas, 2009). Results from Benin suggest that radio access increases household valuation of bed nets. In response to this increase in demand, the local officials responsible for bed net distribution charge a price for nets that they could have distributed for free.

These officials could, in principle, meet increased household demand by increasing supply. However, in contrast to pricing decisions that are effectively within local discretion, supply decisions are not. To increase supply, local officials must petition for and higher authorities must agree to

[1] In Benin, the government is the dominant provider of bed nets and donors are the main source of finance for government bed net programs. Bed nets are supplied through the regular channels of government health service delivery—by local health workers. Section 3 below provides further details.

provide a larger allocation of bed nets. If such a supply response occurred, households with greater radio access would report a larger number of bed nets. In fact, radio access has no effect on the total number of bed nets reported by households.

Further tests on the mechanism of radio effects are consistent with these reduced-form results. Households with more access to radio have greater knowledge of health issues that could affect their private demand for bed nets. However, they have no greater knowledge of government health policies that might influence their ability to hold local officials accountable.

The data do not reveal whether local officials retain household payments for bed nets as rents, or use the payments to finance other improvements in local health services. Other research (e.g., Reinikka and Svensson 2004) has interpreted evidence that local officials do not follow centrally-set rules as a sign of "local capture". Such an interpretation is possible here, as well, since international donors, who are significant sources of bed nets provided by African governments, prefer free distribution (USAID, 2011). Our results are surprising, however, since they point to greater divergence from centrally-set rules precisely in locales where citizens are *better*-informed. One explanation for this different result is "issue framing" in media programming (Prat and Strömberg, 2011). Broadcasts that emphasize the health value of bed-nets trigger different behavior by local officials than does programming that emphasizes local government accountability for distributing these benefits.

Data on bed nets and radio access were gathered from a March 2009 survey of 4,200 households in 210 villages located across the 32 communes of northern Benin. The design of the survey allows us to circumvent three difficulties with estimating the effects of media access on whether households receive benefits from government distribution programs. The first is the lack of significant overlap between radio stations' broadcast areas and the jurisdiction for which government decision makers are responsible. Absent significant overlap, radio stations may not broadcast relevant information. The second is the endogeneity of media access. The third is the general absence of programmatic distribution of benefits in poor, young democracies.

With respect to the first difficulty, if the broadcast area of a radio station is much larger than the jurisdiction of the relevant government decision maker, it is unlikely that the actions of that particular decision maker will be the focus of media attention. On the other hand, if the broadcast area captures only a small part of a decision maker's jurisdiction, the individuals informed by those broadcasts are less likely to be able to influence decision maker actions. The radio market in this region of north Benin provides an appropriate overlap between broadcast area and government jurisdiction to test responsiveness to informed citizens. This market consists of twenty-one small, private, non-commercial or community radio stations organized at the commune level, the political and administrative jurisdiction at which village health center staff are managed and held responsible for distributing bed nets to households. Moreover, we can confirm from donor and government documents that these radio stations indeed carry programming about bed nets distribution and the health value of bed nets.

We address the identification problem by using a "natural experiment" in these media markets in northern Benin, which provide for. Three characteristics of these markets ensure that substantial intra-commune variation in radio access across villages is exogenous to village characteristics. The first is the number and dispersion of small community stations. Because of the sheer number of small broadcasters with limited signal strength, insignificant geographic differences between villages lead to substantial variation in village access to radio signals, whether from within or from outside the commune.

Second, the histories of these stations indicate that founders' decisions to establish a radio station in a particular commune did not depend on the characteristics of neighboring communes. Variation across villages within a commune to signals from neighboring communes is therefore particularly likely to be exogenous to village characteristics.

Third, within every commune, the sample of villages was purposively drawn so that villages are approximately equidistant from radio towers and roads, mitigating possible sources of endogeneity in village access to within-commune radio stations. We confirm that observable characteristics of villages that could be associated with bed nets acquisition are uncorrelated with degree of radio access.

The breadth of bed net distribution programs in Benin circumvents the third difficulty. In younger democracies such as Benin's, programmatic policies to distribute benefits are systematically under-provided, so there is simply very little to study (Keefer 2007). Similarly, in young democracies programmatic policies may not be politically salient, reducing the likelihood that media would cover them or that individuals would listen to media programming. Benin, though, regularly receives large amounts of donor funding to support anti-malaria programs, including the distribution of bed nets. For example, in 2007, donors supplied 1.7 million bed nets for free distribution to pregnant women and children under five. Bed net distribution is therefore likely to be sufficiently politically salient to trigger media effects on political responsiveness.

Programmatic policies that provide broad public services such as education are often difficult for citizens to evaluate and attribute to government performance, as discussed in Keefer and Khemani (2010). Access to media-provided information is less likely to trigger government responsiveness in these cases. Bed nets do not have this disadvantage: like welfare payments, for which previous research has found substantial evidence of media effects on political responsiveness, bed nets offer privately verifiable benefits that have substantial financial and health value to households.

The interactions we uncover between pricing and media strategies to encourage bed net use have significant implications for policy. Recent research has shown that positive prices for bed nets can significantly undermine household take-up of bed nets and lead households to shift the allocation of bed nets away from its most vulnerable members (Cohen and Dupas, 2008; Hoffman, 2009). This has led donors (e.g., the World Bank, WHO, and Population Services International) and policy researchers (e.g., the Poverty Action Lab) to endorse the free distribution of bed nets (see http://www.povertyactionlab.org/scale-ups/free-insecticidal-bednets).

However, donor efforts to encourage the take-up of bed nets have a significant media component that earlier studies of bed net pricing effects have not been able to take into account. The analysis here shows that, in practice, government officials are more likely to require payment for bed nets in areas with high media coverage. This suggests that the large negative effects of cost-sharing on bed net usage found in the literature may be significantly muted in the presence of media interventions that increase demand.

The results also inform the trend in international development assistance to improve governance in poor countries through greater citizen participation, openness and transparency (Zoellick 2011). The results here indicate that, by itself, and in contrast to previous research, the media dissemination of general policy information (e.g., on the availability of a government benefit) is not sufficient to enable citizens to demand greater benefits from government. This is because incomplete information is only one of several "political market imperfections" (Keefer and Khemani 2005) that can obstruct collective action by citizens to increase government responsiveness. The

evidence from Benin implies that transparency interventions should focus on how issues are framed in order to address these other political constraints.

The literature review that follows identifies the contribution of the paper both to prior research on media effects and to research on the determinants of bed net take-up by households. Section 3 describes elements of bed net distribution and the media market in Benin that are essential to understanding our empirical strategy. A discussion of that strategy – the identification of media effects – follows next in Section 4. The empirical hypotheses and results are then presented in Section 5. Our main results show significant effects of media access on the pricing of bed nets. We also present evidence on mechanisms and the effects of radio access on household knowledge. The main results are also robust to numerous alternative specifications. The conclusion in Section 6 highlights the policy implications of this work.

2. Literature review

Prior research has found that greater media access by individual households or in narrow geographic jurisdictions increases the likelihood that these will receive targeted benefits from government programs. Citizens with greater media access are more informed about these programs and more likely to participate in political actions to hold government accountable for the delivery of these benefits. Anticipating this, governments target greater benefits to citizens with greater media access (e.g., Besley and Burgess 2002, Strömberg 2004). We find that, in a different policy context and institutional setting, governments respond to more informed citizens not by giving them greater benefits, but instead, by exploiting these citizens' greater willingness to pay for benefits.

The results here are related to those in Keefer and Khemani (2010), who use the same data from northern Benin and find that schools located in villages with greater radio access have no greater government-provided inputs (such as teachers or books), nor more responsive public agents (lower teacher absenteeism) nor more active PTAs. The research here provides a stronger test of whether more informed citizens receive greater benefits. First, both radio coverage and the pricing of government-provided bed nets are local. In the case of education, key decisions are national or departmental, well beyond the coverage of any individual community radio station. Second, mass media is likely to have a larger effect on government responsiveness in the implementation of a private benefits distribution program than in the provision of a broader public good like education, where government's contribution to final outcomes is difficult for households to discern.

In the case of education, for example, households are uncertain about whether their children are learning because of inputs provided by government departments, because of the actions of the front-line provider (the teacher), or because of the households' and children's own efforts. In order for media access to improve government accountability for better education services, media would have to provide information that allowed households to pinpoint the particular contribution of government policies to their welfare. This contribution is easier to define in the case of targeted transfer payments (as in previous research), or the provision of free mosquito bed nets, as in this paper. In the case of bed nets, for example, media programming provides sufficient information to households to identify the government's contribution when it indicates the importance of bed nets for the prevention of malaria and broadcasts details of the eligibility and timing of the government's bed net distribution program. As with transfer payments, households can immediately verify whether the nets are, in fact, freely available.

Despite the similarities of bed net provision and targeted transfer payments, previous research finds a significant effect of media access on the receipt of transfer payments, but we find no

effect on the receipt of bed nets. The analysis here supports explanations for this apparently anomalous finding that emerge from two lines of research.

First, recent research highlights the importance of "issue framing" in analyzing the impact of media-provided information on outcomes (Prat and Strömberg, 2011). The analysis here provides an example of its potential importance. Community radio stations in Benin broadcast the information that earlier research has pointed to as key for government responsiveness in delivering greater benefits –information about the availability of government bed net distribution programs. Nevertheless, households' media access in Benin does not in fact translate into greater benefits from this program. Issue-framing may explain why.

Community radio programming emphasizes the health benefits of bed nets rather than the obligation of local officials to provide nets for free. Donors and international NGOs buy substantial air time on radio and are significant sponsors of health programs. They describe their malaria-related programming as intended to influence household health practices and to increase household valuation of public health goods through "social marketing". They do *not* describe programming content that emphasizes issues of local government accountability.

Second, research emphasizes the importance of other types of political constraints to government accountability. Keefer and Khemani (2005) suggest two such "political market imperfections", other than imperfect information: societies may be socially polarized, or political competition might be rooted in clientelist promises of privately targeted benefits that are only delivered within clientelist networks and not influenced by general media access. Keefer and Vlaicu (2008) examine how clientelist promises emerge when politicians cannot make credible pre-electoral commitments to voters at large. Khemani (2007) further suggests that the type of information required to surmount these other political market imperfections is not likely to be easily available from mass media in clientelist democracies. Benin has many of the characteristics of a democracy in which clientelist forms of electoral mobilization predominate.

The analysis here also contributes to the public health literature and research on the effects of pricing and media on the usage of bed nets, by showing a significant interaction between pricing and media strategies to encourage take-up. One body of research investigates the effects of pricing on whether households acquire bed nets and on how they allocate them once they acquire them. In a randomized experiment in Kenya, Cohen and Dupas (2008) find a high price elasticity of demand—uptake drops by sixty percentage points when the price is raised from 0 to $0.60 (about eighty percent of the prevailing price in Kenya). [2] Hoffman (2009) compares two randomly selected groups of maternal caregivers in Uganda. One group received cash and the opportunity to purchase bed nets and the other received free bed nets. Relative to all others in the household, net usage by the most vulnerable members, children five years and younger, was lower in the group that paid for bed nets. This research abstracts from the impact of media campaigns aimed at increasing the demand for bed nets. Our results show that households with greater radio access and exposure to health-related programming are significantly more likely to own paid bed nets, suggesting a possible dampening effect on the price elasticity and allocation results reported in the literature.

Little research examines the effects of different information strategies on bed net usage. Dupas (2009) finds that social marketing has no effect on price sensitivity. We find the opposite,

[2] Mahajan, et al. (2009) use non-experimental data and find that among poor households in rural Orissa, one of India's poorest states, net purchase decisions are insensitive to a 50 percent increase above the prevailing bed net price. However, the prevailing price was positive, not zero, in contrast to the Kenya case.

looking at a different communications channel: households exposed to more community radio are more likely to have purchased bed nets.

Finally, a large communications literature shows that focused media programming can influence household behavior in public health and family planning, though these studies do not control for the endogeneity of radio access (Arnold and Lambino 2009 provide a review). Other work, which does address this endogeneity, does not examine effects on public health products, as in the analysis here. For example, Chong and La Ferrara (2009) report that expanding access to the broadcasts of soap operas in Brazil increased rates of divorce and separation; La Ferrara et al (2008) find that it reduced fertility. The potential adverse influence of radio access on household behavior, with tragic consequences, was recently quantified in Yanagizawa's (2009) work on the impact of "hate radio" in the Rwandan genocide.

3. The institutions for distributing malaria nets, and media access in Benin

Benin is a small country in Francophone West Africa with a population of about 8,400,000. It is appropriate for the study of media effects on government responsiveness for several reasons. First, it is sufficiently democratic that results in prior research might suggest that media access would increase government responsiveness.[3] By the standards of the region, it has a relatively long (20 year) history of competitive elections and peaceful turnover of political power. It is also known for its vibrant network of local radio media. According to ratings of *Reporters Without Borders* from 2009, the year of our survey, Benin ranks 72nd in the world, out of 175, in terms of freedom of the press, just behind Brazil (number 71), Botswana, Malawi, Tanzania, Liberia and Togo, but substantially ahead of most other African countries.

Both media and government services are organized by commune. Benin has 77 communes, ranging in population from under 40,000 to over 700,000. They are the electoral districts from which 83 members of the national assembly are elected through a system of party-list proportional representation. They are also the lowest tier of government, with each commune government consisting of a council of directly elected members who elect a mayor from among their ranks. Income per capita is approximately ten times greater in the richest compared to the poorest commune.

The distribution of malaria nets in Benin

Malaria is endemic throughout Benin. Successive national malaria control programs have spent substantial resources on the distribution of insecticide-treated bed nets in the country, nearly always with the significant support of foreign donors. Most distribution plans aim for free distribution through the government's local (village-level) health facilities and staff. These health staff and facilities are managed at the commune level.

Donors and government also support the distribution of some bed nets through social marketing by the private sector, at heavily subsidized prices (USAID 2011, p.7 and p. 14), but this is a relatively small portion of the bed nets market. For example, the only major private organization engaged in distributing subsidized bed nets in Benin, Population Services International (PSI), reported selling 75,000 bed nets in 2009[4], compared to 1,450,000 nets that were distributed by the

[3] Our arguments diverge from those in the literature, since young democracies exhibit other, non-informational political market failures not discussed in prior literature on media and accountability.

[4] According to an April 23, 2011 email to the authors from, Njara Rakotonirina, Technical Advisor, PSI-Benin.

government in 2007, and 800,000 in 2009, under the international Roll Back Malaria program (sponsored most notably by UNICEF, the World Health Organization and the World Bank).

Donors finance and supply the vast majority of bed nets distributed by the government in Benin. The United States President's Malaria Initiative was responsible for the majority of the nets distributed in 2009.[5] At the end of 2010, 4.7 million insecticide-treated nets were to be distributed, only 125,000 of which were financed directly from the government budget (USAID 2011, p. 19). Project documents make clear that donors focus on free distribution, especially targeted to vulnerable populations of pregnant women and young children, and not on pricing strategies. Targets for USAID contractors, for example, never refer to cost recovery, emphasizing instead aggressive goals for the coverage of vulnerable populations. Government policy documents also emphasize free distribution because bed nets are classified as "essential" goods (USAID 2011, p. 14).

On the other hand, as part of the general health financing policy of the government of Benin, local health officials are permitted to charge certain fees for health services under national guidelines and exemption policies (such as for indigent households, and for essential goods). Local health centers are entitled to retain any fees to finance the services they provide. However, because the government has little capacity to monitor adherence to guidelines and exemption policies, local officials can exercise significant discretion in the prices they charge and to whom they charge them.[6] Local government officials, therefore, have an incentive and the opportunity to charge for bed nets. They could use these fees, in collaboration with community committees, to provide more services to citizens in their areas. Of course, they can take also advantage of weak financial controls to divert the fees to personal uses.

In contrast to the control that local authorities exert over pricing, the quantity of bed nets allocated to a local health center is determined by the commune-level representatives of the central offices of the National Malaria Control Program.. After donor-provided bed nets arrive in the port of Cotonou, the government, or NGOs contracted by donors or the government, distributes them to targeted areas. Donors or their contractors often monitor distribution down to the departmental level, but not from the department to more than 700 government health centers, nor from the health centers to households.[7] Local, village officials can only secure larger allocations for their health centers if they can persuade commune officials to respond to local information about household demand and increase allocations accordingly.

Anti-malaria campaigns also include communication efforts, including local radio programming (USAID 2011, p. 7). The evidence presented in the next section reflects this: community radio stations broadcast significantly more health and education information than other stations. This programming is intended to increase demand for and proper usage of bed nets, in part simply by alerting listeners to the imminent arrival of bed nets at local health centers.

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[5] According to the Plan Intégré des Activités de Lutte Contre le Paludisme pour l'année 2009 au Bénin, http://rollbackmalaria.org/countryaction/docs/warn/beninPlanPNLP2009.pdf, p. 8.

[6] USAID (2011, p. 10 and p. 14) emphasizes the weakness of the country's health infrastructure and lack of knowledge of government pricing policies.

[7] For example, in its 2009 BASICS contract (Basic support for institutionalizing Child survival), USAID expected the contractor to ensure that bed net supply logistics were in place with partners down to the departmental level only (not the commune or community level) (http://www.fightingmalaria.gov/funding/contracts/basics_task-order.pdf, p. 8).

We estimate the effect of radio access on how many bed nets households report, including how many they purchased and how many they received for free. A serious problem of inference would arise if anti-malaria media campaigns were focused on those areas targeted for paid bed nets and avoided areas where free bed nets were distributed. There are numerous reasons to conclude that this issue does not arise in the Benin context.

First, policy documents indicate that donors and government exercise little real control over the pricing of bed nets, beyond issuing the general instruction of free distribution, everywhere. Second, even if they did, no documents that mention communications campaigns indicate that donors or governments modulate the campaigns according to their intended pricing strategies. On the contrary, the documents emphasize donor interest in both increasing demand for bed nets and promoting their correct usage: donors prefer to support programming wherever bed nets are distributed. For example, USAID, a major provider of both bed nets and communications programs, contracted with Population Services International to provide communications services. USAID emphasized in its request for proposal only the objective of increasing demand and proper usage, making no mention of pricing issues.[8] Finally, third, evaluations of the anti-malaria campaign in Benin suggest that donors have difficulties reliably implementing and coordinating their communications strategies, which would make coordination with pricing strategies even more difficult (Rwagacondo 2009).

Both the success of these distribution programs in reaching far-flung households, and the ability of local officials to charge for bed nets, are evident in our sample. The analysis is based on our survey of 20 randomly selected households in each of 210 villages across northern Benin. These 4,200 households responded to a detailed bed net module.[9] It asked respondents to list, for each bed net currently owned by the household, precisely how it was acquired. The options were: purchased from private sellers, purchased from government organizations, received as a donation from government, received as a donation from a parent or friend, or some other source. Of the sample households, 86 percent report having at least one bed net of any kind; 69 percent report having received at least one free bed net from the government; and 16 percent of households purchased at least one government bed net.

There appears to be considerable scope to increase the supply of bed nets to ensure full coverage of all household members. The average household in our sample reports 0.38 bed nets (both treated and untreated) for each household member. Our work is therefore undertaken in a setting in which the government could respond by providing more bed nets, whether free or for a payment, to households that place a greater value on them. A supply response could be particularly important for malaria prevention given that old nets are likely to have lost their insecticide treatment and have reduced effectiveness against mosquitoes (Dupas, 2009). Media access has no effect, however, on the total number of bed nets reported by households.

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[8] http://www.fightingmalaria.gov/funding/contracts/psi_coop-agreement.pdf. PSI is a major contractor for the development of communications campaigns in Benin.

[9] We do not, however, have reliable data on the actual usage of bed nets by households (who sleeps under the bed nets, how regularly, etc.), since information on these dimensions is particularly difficult to collect through multi-purpose surveys. Further below in the paper we discuss in more detail how to interpret our results on source of bed nets in terms of household usage. We also do not have sufficiently accurate data on whether the bed nets reported by households are properly treated with insecticides of the long-lasting kind or whether the insecticide is still effective. These issues are, of course, of critical importance in micro-experimental studies of take-up and use of bed-nets (as in Dupas, 2009). Our contribution is to examine the more macro effects of exposure to mass media.

Media access in northern Benin

A key feature of media markets in northern Benin is the proliferation of community radios. Donor representatives and station managers confirm that they support programming that broadcasts general information about bed net availability and announcements regarding the timing of distribution. The prior section emphasizes the discretion of local health centers in the provision and pricing of bed nets. Community radio is also meant to influence the performance of such local institutions, either directly, when stations report on that performance, or indirectly, when stations sponsor call-in programs in which commune residents can discuss performance. Community radio access could therefore play a significant role in whether households acquire bed nets. Moreover, the same information that encourages households to take advantage of the bed net distribution program – telling households of the existence of the program, its eligibility requirements, and how to gain access to the program's benefits – also (potentially) promotes political accountability, since households can easily identify whether they received promised program benefits or not.

Our data include extensive information about community radio access and characteristics, including ownership, licensing, and programming, on all 68 radio stations operating in Benin as of March and April 2009. Table 1 summarizes some of this information. The national public radio station is essentially everywhere in northern Benin. In addition, though, the region is covered by a number of local community stations that are non-commercial by vocation, but also because there is no market for commercial advertising. These stations finance themselves by selling airtime to donors and government ministries. These sponsor programming to encourage households to make better decisions regarding health and education, including the acquisition and proper use of bed nets.

The southern region of Benin is more urbanized and densely settled. Most areas have access to multiple national and commercial radio stations and there is little within-commune variation in access across villages. Since our estimation focuses precisely on within-commune differences, we focus on the 32 northern communes of Benin.[10] These exhibit substantial within-commune variation in radio access across villages that is exogenous to village-specific characteristics.

Table 1: Access to Radio Stations in North Benin

	No. of stations accessible to the region	No. of sampled villages covered (Total=210)	Average Signal Strength	No. of health programs broadcast (over the past 3 months)
Government-owned Public Radio	2	190	2400 watts	33
Private Non-commercial or Community Radio	21	195	207 watts	138
Private Commercial Radio	10	49	476 watts	40
Religious Radio	2	71	.	36

[10] Only the northern commune of Parakou is excluded; it is the second largest city of Benin, after the capital region of Cotonou in the south.

Fourteen of the 21 community radio stations in the sample depend on funds from foreign donors and three on funds from non-governmental organizations. Regardless of funding source, all of them describe the provision of information on health and education as a "very important" objective. Consistent with this, the average number of health programs reported by station managers is large (138) and more than three times greater than for public or private commercial radio. Hence, access to a higher number of community radio stations is likely to be associated with exposure to more information about health issues.

To measure the number of radio stations to which households have access, enumerators first asked village-level key informants to list which radio stations they were able to receive. The enumerators also used their own transistor radios to verify and expand on this, if they received additional signals. We did not ask enumerators or village informants to describe the type of radio station or the nature of its programming. Instead, the radio codes from the village survey were matched with the radio survey data to examine the nature of programming available to the village.

Since community radio stations have low signal strength, no single station is accessible to more than a few villages in our sample. However, because the number of community broadcasters is large, at least one community signal is accessible to 93 percent of our sampled villages. Only a few villages in our sample (23 percent) have access to private commercial radio. Although private radio has greater signal strength, it is concentrated in the southern communes of Benin, outside our study area. Government-owned public radio has several relay transmitters allowing it to cover most of the villages in our sample (92 percent) with uniform programming. The information from religious stations is less reliable (for example, in the case of signal strength). However, only 13 respondents identified a religious station as their most preferred broadcaster.

The number of community radios to which villages have access ranges from zero to seven stations, averaging 2.4 and with a standard deviation of 1.5. All but 20 villages in the sample receive strong signals from one or more relayers of the national broadcaster and nearly all villages (175) have access to both a community radio station and national public radio. About 23 percent of villages have access to private commercial and 34 percent to religious radio stations.

Of the 3828 households that listen to some radio, 64 percent report listening to at least one community radio station and 45 percent report listening to national public radio.[11] Only 176 report listening to private commercial radio.[12] These preferences are consistent with availability (few households have access to private commercial radio), and with claims of broadcast media experts that the programming of national broadcasters conforms less well to the tastes and linguistic preferences of poor households in rural Africa compared to local radio stations (Buckley et al, 2008).

The observations drawn from the survey are not contaminated by noise from other mass media. Especially in the study area in northern Benin, radio is essentially the only media to which most citizens have access. Twenty-five percent of respondents to the nationally representative Afrobarometer (2005) survey of Benin report that their household owns a television. In the sample here, of 4200 households from northern Benin, only eight percent own a television, but 84 percent

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[11] "Listenership" data was gathered by simply asking households to name the station they listen to and then having our investigating team post-code the response for type of radio. We did not directly prompt the household to categorize what *type* of radio they like listening to.

[12] Even among these 176 that report listening to some private commercial radio, only 67 report listening *only* to commercial radio; the rest listen as well to at least one other public or community radio station.

own radios; television ownership in this sample is uncorrelated with access to good radio signals. Newspapers also have little penetration. The largest has a circulation of 7,000, and that almost entirely in the capital city of Cotonou. Interviews with radio station staff indicate, however, that their news reports about Benin are often prepared based on reports from the Cotonou newspapers.

4. Identification—The "natural experiment" in northern Benin

As in all work on media effects, the analysis here confronts the possibility that unobserved factors influence both media access and outcomes of interest, such as whether households have received bed nets from the government and whether they have paid for those nets or received them for free. The radio market in northern Benin allows us to use a novel strategy to control for these factors. In particular, many small radio stations with limited signal strength dominate the media market, each carrying similar programming that is likely to influence household demand for bed nets. Because the stations are small, dispersed and numerous, villages that are close to each other and not separated by any remarkable topographical features can nevertheless exhibit significant differences in access. Short distances and small changes in elevation are enough to degrade the signal received by some of them. These differences are unlikely to affect bed net distribution except through their influence on radio access.

In contrast, previous research has relied on geological features that obstruct broadcasts from one or a few large stations (Strömberg, 2004; Olken, 2009; and Yanagizawa, 2009). Researchers argue that these topographical features exogenously distinguish areas with more or less radio access. Most debate centers on the exclusion assumption, that these features have no direct effect on outcomes of interest. To the extent that topographical differences between communities with more and less access are significant, the exclusion assumption is more controversial. For example, geological obstacles that leave communities with less radio access to a large station might also render them significantly more isolated in all respects compared to communities with more radio access. The effects of radio access are then entangled with those of remoteness. Issues of external validity may also be more pronounced, since the effects of media access on remote jurisdictions may not be the same as in the rest of the population.

The topographical features that yield variation in access to radio signals across villages in our sample are exogenous. However, it is possible that the location of community radio stations is not and is related to unobserved characteristics of the villages that receive them. The histories of individual radio stations, our purposive selection of the village sample and the use of commune fixed effects substantially mitigate these concerns.

Most of the small community radio stations were established through the support of donors and governments, who cared about reaching remote and rural areas but were otherwise indifferent to radio location. By themselves, these selection criteria would be ideal for our purposes. However, donors needed local partners to establish the stations. Idiosyncratic conditions within communes affected which communes yielded such partners. Ahokpossi (2009) argues that potential radio entrants in Benin viewed the commune as their relevant market and took commune-specific characteristics into account in deciding whether they would locate. Commune-specific characteristics, related to economic conditions and political struggles within a commune, therefore ultimately affected where radios were established

Gratz (1999) details the history of one of these community radios, Radio Tanguieta located in Tanguieta commune in Atacora department. Local politicians controlled the community radio and Gratz reports concerns about embezzlement and over-spending on salaries of numerous radio

announcers representing different ethnic groups. Unobserved, commune characteristics evidently subject community radio projects to the same political risks of local elite capture and clientelist and ethnic politics as community-based projects in other sectors. Since these could plausibly affect education outcomes, we do not exploit inter-commune differences in community radio access to identify radio effects on patterns of bed net distribution. Instead, all estimates control for commune fixed effects and identify the influence of community radio based solely on intra-commune variation in radio access.

Unobserved cultural and economic characteristics of villages may lead some villages to enjoy both more access to within-commune community radios and to receive more free bed nets. To address such concerns, we used maps showing the location of villages, radio towers, and major road networks to restrict the sample frame to 210 villages that were approximately equidistant to (equally remote from) radio towers and roads inside the commune.[13] Complementing the fragmentation of the Benin radio market, the sampling frame yields variation in within-commune radio access driven by station location and transmission conditions that are exogenous to the sampled villages.

However, most of the variation in access to radio signals is explained by differences in access to out-of-commune radio stations. The average household has access to .63 within-commune community radio stations, with a standard deviation of .51. It has access to 1.78 out-of-commune stations, with a standard deviation of 1.45. Most of the access variation in the sample is therefore due to variation in signals from neighboring communes.

This, however, does not attenuate the ability of our tests to pick up the traditional accountability story in the literature: those households with more access to out-of-commune stations are better-informed about the existence of bed net distribution programs, the pricing of bed nets and the need for bed nets, all critical ingredients in accountability. Out-of-commune stations do not inform them about the compliance of their local officials with centrally-mandated rules regarding pricing, but their personal observation of local official behavior makes this irrelevant.

If radio access is the product of exogenous factors and if the sampling strategy was successful, villages with more and less community radio access within a commune should be indistinguishable. In particular, if observable characteristics of villages do not differ systematically, unobservable village characteristics that could cause a spurious relationship between radio access and bed-nets distribution are also likely to be the same in villages with more and less radio access. In fact, Table 2 shows that radio access is uncorrelated with a wide range of observable village characteristics.

[13] Unfortunately, no data were available on the precise GPS locations of stations and villages to directly control for this in our analysis. The best we could do was rely on pictorial maps provided by our local consultants to "eyeball" neighboring villages that were located equally distant from radio towers. However, as we discuss below, we are able to verify that our sampled villages exhibited no correlation between radio access and observable characteristics of location that could independently impact education outcomes.

Table 2: Correlates of village access to community radio
(*Commune fixed effects, robust p-values in parentheses*)

	Number of Community Radios	Share of Community Radios
Village population (1,000s)	-.014	.002
	(0.78)	(0.77)
Distance of village to nearest urban center	-0.00609	-0.000312
	(0.14)	(0.65)
Distance of village to nearest bus or train stop	-0.00410	-0.000156
	(0.30)	(0.75)
Number of functional private schools	-0.227	-0.0133
	(0.28)	(0.72)
Fraction of surveyed households with income < 30,000 CFA Francs	-0.383	-0.0825
	(0.23)	(0.20)
Fraction of surveyed households with a mobile phone	0.346	0.109
	(0.47)	(0.33)
Most common language in village and commune is the same	0.301	0.0249
	(0.24)	(0.48)
Probability that main language in any two households in the village is the same	-0.558	0.0608
	(0.27)	(0.35)
Mean number of houses in village with brick walls	0.298	0.159
	(0.46)	(0.11)
Mean number of houses in village with more than 5 rooms	-0.355	-0.0584
	(0.52)	(0.54)
Fraction of surveyed households with a television	1.118	-0.274
	(0.41)	(0.17)
Observations	200	200
R-squared	0.78	0.69

Note: The columns report OLS estimates of the association of measurable village characteristics with the number or share of community radio stations to which villages have access, controlling for commune fixed effects.

The village survey includes data on village distance from urban centers and to a train or bus stop; smaller and more remote villages could both be likely to have fewer accessible radio signals and lower investments in health. The most recent census in Benin, from 2002, has information on village population for nearly all of the villages in the sample. Poorer villages might have unobserved characteristics that affect both radio access and be targeted by the government for bed-nets distribution. Though there is no census or statistically representative data of incomes and economic

conditions at the village-level in Benin, the surveys offer several proxies for village incomes. Most are based on village averages of responses to the household survey: the percentage of households that report their income as belonging to the lowest of the income brackets; the percentages of sampled households that report owning a mobile phone and a television; the percentage of households surveyed with brick walls; and the percentage with houses with more than five rooms. With 20 observations per village, these averages are only precise enough to test whether larger income differences separate villages with more and less radio access. From the village surveys, it is also possible to compare villages according to the number of private schools serving the village.

Finally, village linguistic characteristics could affect which radio markets the village is in and be independently related to cultural norms that influence health practices or to the ability of the village to attract government programs. Based on the household survey, it is possible to compare villages according to, first, the probability that any two of these households would speak the same language at home; and, second, an indicator variable for whether the most common language among the sample of 20 households in a village is different from the most common language among all the households surveyed in the commune in which that village resides.

Table 2 reveals no statistically significant association between any of these variables and either the number of community radios to which villages have access or the share of community radios as a fraction of all radios to which a village has access. The variable closest to significance is the distance of a village from the nearest urban center, in the first column, but its effects are small. A one standard deviation increase in distance (18.7 kilometers) is associated with access to approximately 0.11 fewer radio stations. Brick walls are more common in villages with a larger share of community radios but, the effect is not quite significant and, again, its magnitude is small. A one standard deviation in the fraction of households with brick walls (19 percent) is associated with only a three percent greater share of community radios. No measures of income, wealth, remoteness or linguistic diversity are significant. There is, then, no evidence that villages with access to more community radio are significantly different in other ways from villages with less access.

Table 3 reports the bivariate correlations between radio access and each of the variables. In nearly all cases, observable village characteristics are not significantly correlated with community radio access. This time, the correlation between village radio access and distance to an urban center is statistically significant, but the magnitude is small: a one standard deviation increase in distance (18.7 kilometers) is associated with access to .19 fewer stations (less than .20 of a standard deviation). This observed heterogeneity has no impact on our results. Among the 75 percent of villages that are no more than 32 kilometers from the nearest urban center, the correlation disappears. The results reported below are robust to looking only at this smaller sample of villages.

The fraction of households reporting incomes of less than 30,000 CFA francs is also marginally significantly correlated with community radio access. A one standard deviation increase in this fraction (.21) is associated with access to .12 fewer community radio stations, less than 10 percent of the standard deviation of community radio access. Again, however, these differences have no effect on the results. The correlation disappears among the 75 percent of villages where fewer than 53 percent of villages report low incomes and the results reported below are robust to looking only at this subsample.

Table 3: Bivariate correlates of village access to community radio
(*Bivariate regressions; commune fixed effects; robust p-values in parentheses*)

	Coefficients from bivariate regression (*p-value*)
Village population (1,000s)	.05 (.29)
Paved road	.33 (.26)
Potable water source	-.01 (.74)
Village chief has some primary or secondary education	.23 (.15)
Distance of village to nearest urban center	-.01 (.09)
75% of villages $\leq$ 32 km from nearest urban center	-.001 (.91)
Distance of village to nearest bus or train stop	-.01 (.25)
Fraction of surveyed households with income < 30,000 CFA Francs	-.57 (.10)
75% of villages where this fraction is < .53	-.81 (.30)
Fraction of surveyed households in dwelling with	
brick walls	.58 (.25)
cement floors	-.11 (.81)
more than 5 rooms	-.18 (.78)
Most common language in village and commune is the same	.25 (.31)
Probability that main language in any two households in the village is the same	-.31 (.57)

Note: The columns report OLS estimates of the bivariate associations of measurable village characteristics with the number or share of community radio stations to which villages have access, controlling for commune fixed effects.

In sum, the fragmentation of the Benin radio market and a sampling procedure that exploits variation in access to out-of-commune community radio stations allow us to include more homogeneous villages than has been possible in previous research. Most studies of media impact are based on variation across jurisdictions or households in their access to the same large broadcasting or publishing outlets. In contrast, the analysis here is based on within-commune variation in village access to small community radio stations. Unobserved differences between commune villages that can access out-of-commune radio broadcasts and those that cannot are likely to be insignificant compared to the differences between villages that can access centrally-broadcast media and those that cannot.

5. Village-level variation in radio access and bed-nets distribution

The analysis that follows examines two hypotheses. First, if radio access enhances government responsiveness, households with better access to community radio should be able to obtain more bed nets from government distribution programs, particularly free bed nets, than households without. Second, if radio access changes household behavior and increases household demand for and valuation of bed nets, then we should, in principle, see an effect on the prices paid and quantity of bed nets reported by households. However, in the institutional setting in Benin higher-level government officials decide the quantity of bed nets available in a village. We expect local-level media to have little effect on the decisions of these officials, and therefore little effect on the quantity of bed nets supplied locally.

Instead, if radio access increases household demand supply effects should be largely confined to pricing decisions, over which local officials have control. In particular, local officials should sell bed nets that they could otherwise distribute for free in areas with greater radio access. The second hypothesis, then, is that greater radio access will have a positive effect on the number of paid government bed nets that households report and no effect or a negative effect on the number of free government bed nets they report. Because higher level officials responsible for allocations are less responsive to local media, and because the private market in bed nets is small, greater radio access should have no effect on total bed nets in the household.

The Benin data lend themselves especially well to tests of the effects of media access on government accountability, the first hypothesis, since we not only know household access to media, we also know the content of media programming. Prior research has examined the reduced form effects of media access on government transfers, implicitly suggesting that these effects arise because media raises awareness of the transfer program: whether a program exists, eligibility for the program, how one gains access to program benefits, and when those benefits are available. Accountability also requires that citizens know the actors who are responsible for delivering the benefits. Our data allow us to confirm that all of this information is accessible in Benin and is broadcast on community radio stations.

This is significant, since important areas of public policy are often not covered by the media. Reports of natural or economic disasters are more intrinsically interesting and attract a wider audience than analyses of the efficacy of government education or malaria policy (Drèze and Sen, 1990; Eisensee and Strömberg, 2007; Khemani, 2007). This is not a constraint in northern Benin, however, since a significant share of the programming of the sample radio stations is dedicated to health and education programming. In addition, malaria policies stand in contrast to public policies with complicated production functions, such as education, in which the contribution of government to final outcomes is difficult to discern. Compared to education, media can more easily inform citizens about the contribution of government to bed net availability and the effect of bed nets on malaria.

While community radio programming in Benin transmits the information that prior research has suggested matters for accountability, two considerations that have emerged more recently in the literature may mitigate accountability effects. The first is the concern about framing discussed earlier (e.g., Prat and Strömberg 2011): even if the information is presented, it may not be framed in such a way as to promote an accountability effect. Second, and related citizens may confront other obstacles to holding politicians accountable ("political market imperfections", as in Keefer and Khemani 2005), that obstruct their efforts to demand better services or higher transfers even if they are well-informed about the policy.

The political setting in Benin exhibits characteristics which would weaken the capacity of citizens to act collectively to sanction non-performing incumbents. Credible political commitments are, in developed democracies, mediated by programmatic political parties. In Benin, these parties are absent. The number of parties has fluctuated between 129 and 27 since competitive elections were first held in 1991. Over 100 tried to compete in the 2007 elections (Economist Intelligence Unit). None of the four major parties emerging from the 2007 elections had a programmatic identity – a basis for making credible commitments to large groups of citizens. Party fractionalization is correspondingly high: in 2006 the probability that two randomly selected legislators do not belong to the same party was 80 percent in Benin, compared to 52 percent in Ghana (Beck, et al. 2001). Even those households with access to mass media should therefore find it difficult to participate in collective action to demand access to free bed nets. Instead, in line with Keefer and Vlaicu (2008), their access to free bed nets is more likely to be a function of their membership in the right clientelist networks.

Even if political market imperfections, other than incomplete information, limit the effects of media access on government accountability, media access could nonetheless increase household demand for bed nets. If radio stations broadcast pertinent information and households listen to the broadcasts of that information, household demand for bed nets should increase. However, given prevailing market institutions in Benin for the supply of bed nets, the most likely response to increased household demand, in the absence of higher level government responsiveness, comes from the pricing decisions of local officials. Specifically, recalling the considerable discretion in local officials' pricing decisions but not in quantity supplied, local officials should respond to increased demand for bed nets by reducing household access to free nets and requiring them to pay a price in areas with high radio access, the second hypothesis.

These hypotheses are tested with regressions specified according to (1):

$$(1) \quad Bed\ nets_{ijk} = \beta_0 + \beta_1 village\ access\ to\ community\ radio_{jk} + \boldsymbol{X}_{ijk}\boldsymbol{B} + \epsilon_{ij} + \mu_k ,$$

where the dependent variable is, in turn, the total number bed nets (from all sources), the number of free, government-provided bed nets, and the number of paid government bed nets. The units of observation are household *i* in village *j* and commune *k*; μ_k is a commune fixed effect. If access to media increases government responsiveness and household demand for bed nets, $\beta_1 > 0$ for all three bed net variables. If the second hypothesis is correct, and higher demand for bed nets only leads local officials to sell bed nets that could otherwise distribute for free, $\beta_1 > 0$ for paid government bed nets, but is equal to or less than zero for free government bed nets; it is not significantly different from zero for total bed nets, given the small private market for bed nets.

In addition to commune fixed effects, the control variables include the number of children in the household and the number of children five years of age or younger, and the number of adults and the number of adults over 60. Malaria poses the greatest dangers for young children and pregnant women, and anti-malaria campaigns tend to encourage households to protect these populations. The 2007 bed net campaign in Benin specifically targeted young children, five and under. The results below provide no evidence, however, of successful targeting of this group.

The number of bed nets owned by a household, both through government donations and own-purchase, is significantly correlated with the total number of household residents, adults and children, but not, controlling for the total numbers of children and adults, with the number of children reported as younger than five. This could be because our sample size of households with more members of these demographic groups is not sufficiently large to detect such targeting, or because of measurement error in members' ages, especially around the cut-off of 5 years. The

former caveat applies less strongly in our case, since 2,190 households report children under five, or more than 56 percent of the sample on which our estimates are based.

The estimates take into account respondent education, since better-educated households are more likely to understand the importance of bed nets. The regressions also control for a number of dichotomous ethnicity and religion variables, in case particular ethnic or religious groups are better mobilized to take advantage of government services or, in contrast, more likely to be excluded from it. Estimates also take into account a variety of measures of household income (quality of housing construction, cash income levels reported by the household and ownership of mobile phones or a television); the marital status of the household head (including single or polygamous), and the gender and age of both the respondent and household head. The television and mobile phone variables also serve to control for alternative sources of information that might be available to the household.

Finally, the base specifications also control for a number of village characteristics. The education of the village chief should influence both household demand for bed nets as well as the attention that villages receive from government distribution authorities. The distance of the village from the nearest urban center and from the nearest bus stop or train station, as well as the presence of paved roads that service the village, affect the costs of distributing bed nets. The presence of functional private schools captures differences across villages in the demand for social services, while the presence of a secondary school, literacy center or a health or maternity center control for differences across villages in their capacity to attract government resources.

The base specifications all use the number of bed nets rather than whether households have at least one bed net. Although 86 percent of households have at least one net, variation among those households in the number of nets is large: on average, those with any bed nets have 2.2 bed nets, but 30 percent have only one and another 30 percent have at least three. This variation is key, since the number of bed nets in a household determines the actual protection against malaria that household members receive. However, it is possible that radio access should affect whether households have any bed nets at all, rather than the number that they have. This might be the case if nets are rationed and income constraints are severe. In robustness checks that we report, radio access also has a significant effect on whether households report any paid bed nets procured from government.

Another key objective in anti-malaria campaigns focusing on bed nets is to encourage households to use bed nets pre-treated with insecticide, which provide substantially greater protection at low additional cost (Dupas, 2009). Although, as indicated in footnote 8 earlier, we do not have reliable data on whether reported bed nets are in fact treated properly with insecticide or not, the estimates below separately analyze all household bed nets and only pre-treated bed nets. The average household reports 1.9 total bed nets of which 1.6, on average, are pre-treated; it reports 1.2 government bed nets (paid or free) of which, on average, 1.1 are pre-treated. Households report, on average, .24 paid, treated government bed nets. In both cases, we ask whether radio access affects the quantity of nets received free or for a price.

Table 4: Community radio access and household acquisition of bed nets

Dependent variable:	Total bed nets	Free gov't. bed nets	Paid gov't. bed nets	Total pre-treated bed nets	Free gov't. pre-treated	Paid gov't. pre-treated
No. of stations to which households have access:						
non-commercial private	**0.0208 (0.61)**	**-0.0413 (0.15)**	**0.0536 (0.03)**	**0.0361 (0.39)**	**-0.0314 (0.33)**	**0.0514 (0.02)**
public	-0.114 (0.14)	-0.0908 (0.15)	-0.00334 (0.94)	-0.0795 (0.31)	-0.0823 (0.21)	0.0114 (0.79)
commercial private	0.0327 (0.47)	0.0256 (0.40)	-0.0217 (0.46)	-0.0338 (0.51)	0.000752 (0.99)	-0.0160 (0.55)
religious	0.169 (0.03)	0.0832 (0.20)	0.0555 (0.28)	0.0874 (0.27)	0.0601 (0.41)	0.0200 (0.65)
Age of HH respondent	-0.0109 (0.03)	-0.00656 (0.19)	-0.000945 (0.69)	-0.00962 (0.07)	-0.00654 (0.20)	-0.00239 (0.30)
Gender of HH Respondent	-0.158 (0.03)	-0.103 (0.10)	0.00352 (0.93)	-0.0933 (0.22)	-0.0982 (0.13)	0.00332 (0.93)
Elementary Education – Respondent	0.0878 (0.13)	0.111 (0.03)	0.0143 (0.70)	0.124 (0.04)	0.123 (0.03)	0.0416 (0.26)
Secondary Education – Respondent	0.265 (0.00)	0.108 (0.09)	0.122 (0.02)	0.322 (0.00)	0.0923 (0.17)	0.133 (0.01)
Higher Education – Respondent	0.555 (0.02)	0.137 (0.58)	0.0311 (0.82)	0.403 (0.11)	0.0189 (0.94)	-0.0145 (0.89)
Number of adult household members listed	0.249 (0.00)	0.155 (0.00)	0.0335 (0.06)	0.212 (0.00)	0.142 (0.00)	0.0348 (0.04)
Number of HH members aged over 60	-0.0311 (0.74)	-0.0293 (0.70)	-0.0482 (0.26)	-0.0121 (0.89)	-0.0542 (0.42)	-0.0515 (0.20)
Number of children listed	0.162 (0.00)	0.111 (0.00)	0.0110 (0.25)	0.128 (0.00)	0.0952 (0.00)	0.00188 (0.82)

Table 4 (con't): Community radio access and household acquisition of bed nets

Dependent variable:	Total bed nets	Free gov't. bed nets	Paid gov't. bed nets	Total pre-treated bed nets	Free gov't. pre-treated	Paid gov't. pre-treated
Number of children listed aged 0 – 5	-0.0217 (0.49)	0.0220 (0.37)	0.00266 (0.88)	0.00288 (0.93)	0.0290 (0.24)	0.0136 (0.43)
Respondent single	-0.147 (0.11)	-0.152 (0.13)	0.112 (0.03)	-0.135 (0.20)	-0.172 (0.09)	0.0947 (0.05)
Respondent polygamous	0.112 (0.12)	0.0979 (0.09)	0.0639 (0.10)	0.0420 (0.57)	0.0456 (0.46)	0.0612 (0.09)
Respondent Catholic	0.101 (0.15)	0.0184 (0.74)	0.103 (0.03)	0.247 (0.00)	0.103 (0.11)	0.120 (0.01)
Income is between 27.5K and 44K	0.0518 (0.32)	-0.0159 (0.72)	0.0942 (0.00)	0.0337 (0.53)	0.0132 (0.77)	0.0571 (0.02)
Income is over 44K	0.248 (0.00)	0.0457 (0.42)	0.144 (0.00)	0.281 (0.00)	0.124 (0.04)	0.0976 (0.00)
Wall - Brick/Semi-rigid	0.161 (0.01)	0.122 (0.05)	-0.0191 (0.66)	0.114 (0.08)	0.115 (0.07)	-0.0110 (0.79)
Floor – Cement	0.131 (0.02)	0.0179 (0.73)	0.0648 (0.08)	0.141 (0.01)	0.0317 (0.56)	0.0936 (0.01)
Rooms - Five or more	0.363 (0.00)	0.142 (0.03)	0.0536 (0.20)	0.112 (0.13)	0.0588 (0.41)	0.0438 (0.22)
Owns a TV	0.479 (0.00)	0.152 (0.10)	0.0742 (0.27)	0.370 (0.00)	0.137 (0.13)	0.0370 (0.56)
Owns a mobile	0.189 (0.00)	0.0614 (0.21)	0.0346 (0.33)	0.220 (0.00)	0.0774 (0.15)	0.0288 (0.39)
Village chief with secondary education	0.200 (0.01)	0.153 (0.21)	0.0872 (0.09)	0.160 (0.04)	0.128 (0.04)	0.0715 (0.12)

Table 4 (con't): Community radio access and household acquisition of bed nets

Dependent variable:	Total bed nets	Free gov't. bed nets	Paid gov't. bed nets	Total pre-treated bed nets	Free gov't. pre-treated	Paid gov't. pre-treated
Literacy Center Dummy	0.0887 (0.20)	0.139 (0.01)	0.0115 (0.75)	0.137 (0.05)	0.152 (0.00)	0.00826 (0.80)
Health Center or Maternity Dummy	0.0472 (0.44)	-0.0291 (0.55)	0.0262 (0.46)	-0.0471 (0.42)	-0.0666 (0.20)	0.0156 (0.64)
Distance to closest Bus/Train Stop	0.00470 (0.00)	0.00447 (0.00)	0.000340 (0.67)	0.00411 (0.01)	0.00448 (0.00)	5.91e-05 (0.94)
Observations	3,736	3,736	3,736	3,736	3,736	3,736
Adj. R^2	0.27	0.18	0.11	0.21	0.14	0.11

Note: All specifications estimated with ordinary least squares, with commune fixed effects. Robust *p*-values, with standard errors clustered at the village level, reported in parentheses. Coefficient estimates of the following controls are insignificant and not reported: ethnic dummies (Adja, Fon, Bariba, Dendi, Yoa/Lokpa, Peulh, Goua/Otamari, Yoruba); age and gender of household head; and whether the respondent is Islamic. The following village controls are insignificant and not reported: whether the village chief has a primary education; whether a paved road serves the village; the distance to the closest urban center; the number of functional private schools; and the presence of a secondary school.

Table 4 reports six estimates of equation (1). The first looks at the effect of radio access on the total number of bed nets reported by households; the second focuses only on free, government-provided bed nets; and the third examines only the number of government bed nets that the households paid for (did not receive for free). Columns four through six repeat the analysis, but focus only on bed nets pre-treated with insecticide. All specifications contain the same control variables, including commune fixed effects, and are estimated using ordinary least squares. The first row of Table 4 reports the effects of access to non-commercial private (community) radio.

Taken together, the community radio coefficients across the six specifications support the hypothesis that radio access increases both demand for bed nets and a particular supply response – the diversion of free bed nets to the paid market by local officials. Columns 1 and 4 indicate that radio access has no significant influence on the total number of bed nets in the household. This is the result we would expect given the dominance of the national government in the supply of bed nets and the lack of national government responsiveness to citizens informed by community radio broadcasts. The second and fourth specifications show that more community radio access does not increase household access to free government bed nets, treated or otherwise. On the contrary, the coefficients are negative and large, though not statistically significant. The third and sixth specifications show that households with greater community radio access report more paid government bed nets.[14]

These effects are substantively large when compared to other influences on bed net acquisition. Respondents who completed their elementary education did not have significantly

[14] These results are unchanged when the paid government bed net variable is replaced with all bed nets purchased by households, including from non-government sources. However, there is no effect of radio on nets reported to be purchased from the private sector alone. This is not surprising given that government channels dominate the bed nets market in Benin.

more paid bed nets; the estimated effect of secondary education is a fraction of the effect of community radio. A one standard deviation increase in community radio access (1.5 stations) is associated with .08 additional paid government bed nets (columns three or six). This effect is comparable to that of secondary education: households where the respondent had completed secondary education had .12 more bed nets than households with only primary education. It is also comparable to income effects. The richest households, those reporting incomes over 44,000 CFA francs and cement floors, had approximately .20 more bed nets than households reporting less income and no cement floors.

Table 4 results indicate that targeting effects are weak, so strict adherence to a targeting regime is unlikely to explain the lack of media effects on the receipt of free government bed nets. One formal criterion used by the government is that every 1.8 persons in a household are entitled to one bed net. Every additional person should therefore yield at last one-half of an additional free government bed net. Instead, column 2 indicates that every additional adult yields .16 and every additional child .11 additional bed nets. Experts also advise that children under five are the most vulnerable and should receive nets first. However, the coefficient on the number of children five is not significant, though the results in Table 4 do not address how bed nets are actually allocated (who actually sleeps under them).

The educated have more bed nets than the uneducated, and the effect rises with the level of education: those who completed their elementary education have .1 more bed nets than those who did not; those who completed high school have .26 more; and those who completed higher education have .54 additional nets (column one). For secondary and higher education, the correlation operates most strongly on the acquisition of paid bed nets. However, those with only elementary education are more likely to have a greater number of free bed-nets, and no significant correlation with paid bed nets. Households in villages with chiefs who have completed secondary education also report more total bed nets.

Policy Knowledge and Media

Table 4 makes clear that the pathway from media access to greater bed net acquisition is unlikely to run through national government responsiveness, since access has no effect on the total number of bed nets, and on free bed nets reported by households. Instead, it is likely to be the product of changes in household behavior as a result of exposure to radio programs on malaria and malaria prevention, which increase household willingness to pay for bed nets. To examine the mechanisms linking radio access to bed net acquisition, this section estimates the impact of radio access on citizen knowledge. Radio access increases the ability of citizens to hold governments accountable for the provision of free bed nets if it provides them with information about the program – its existence, eligibility rules, and distribution plans – that they would not otherwise have had and if citizens have an incentive to pay attention to it. It increases household demand for bed nets if it informs households about the importance of healthy practices. The survey has information on household knowledge related to both health policies and practices.

We can estimate the effect of radio access on these two types of knowledge using equation (1), substituting knowledge variables for the bed net dependent variables, as in equation (2).

(2) $$Knowledge_{ijk} = \beta_0 + \beta_1 village\ access\ to\ community\ radio_{jk} + \boldsymbol{X}_{ijk}\boldsymbol{B} + \epsilon_{ij} + \mu_k .$$

With one exception, all of the control variables are the same as in Table 4. Visits by health workers to discuss malaria might be important sources of knowledge; these are therefore controlled for, in addition, in all specifications of equation (2).[15]

Only one question in the survey, "What is the government doing to fight malaria?", relates specifically to household knowledge of government bed net policies. Unfortunately, it offers only a weak test of the hypothesis that radio access has no influence on household knowledge of government bed net policies. First, because of the breadth of the free bed net program, nearly all respondents (93 percent) replied, without prompting, that the government distributed free malaria nets. This number is far higher than the 69 percent who actually received a bed net and the 67 percent who were able to receive more than one community radio station. Not surprisingly, the first column in Table 5 shows that the estimated effects of community radio access on knowledge of government bed net campaigns is positive, but insignificant. Second, the question only reflects whether households know of the policy, not whether they know its eligibility rules and distribution plans.

However, the survey contains other questions related to knowledge of general government health policies: can respondents identify the agency responsible for managing government health centers (COGECS)? Do they know the national health policy on providing one health center per arrondissement? And do they know that the fees charged by health centers are supposed to be fixed by the national government? The effects of radio access are entirely insignificant for the first two and only borderline significant for the third. In contrast, there is a significant positive correlation of such policy knowledge with whether a health worker has visited the household.[16] This is consistent with the earlier argument: in an environment in which citizens cannot act on such knowledge, radio stations may not broadcast the information or respondents may not pay attention to it, attenuating links between relevant knowledge and radio access. Keefer and Khemani (2010), for example, show that radio access has no effect on government inputs into schools and, correspondingly, no effect on respondent knowledge of government education policies.

In contrast, radio broadcasts do appear to increase household knowledge of the importance of good health practices. The survey asked whether respondents knew that the use of oral rehydration salts (ORS) is the proper treatment for diarrhea in young children.[17] Fifty percent answered correctly. The second column in Table 5 shows that radio access has no effect on ORS knowledge, but this is misleading. The effects of radio on ORS knowledge should matter most for respondents who are most likely to need that knowledge: women with children in the house. Consistent with this, female respondents and the number of children in the household are strongly correlated with knowledge of ORS – larger than all other variables with the exception of education.

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[15] Health worker visits could themselves be the product of radio access and so are not controlled for in our main regressions of community radio access on bed nets. In fact, all of the results in Table 4 are robust to controlling for health worker visits and all of the results in this section are robust to omitting health worker visits.

[16] Results on these other policy knowledge variables are not included here in the interests of brevity, but are, of course, available upon request.

[17] The ideal knowledge issue to investigate with respect to behavior is whether radio access improves household knowledge of the importance of bed nets. This information is not contained in the survey, however.

Table 5: Community radio access and household health and health policy knowledge

Dependent variables:	Knowledge of gov't bed net programs?	Know ORS treatment for kids' diarrhea?	Conditional radio effects on ORS knowledge	Knowledge of Benin's child mortality rate
Number of non-commercial private stations	**0.00654 (0.24)**	**0.00222 (0.87)**	**-0.046 (0.07)**	**0.0207 (0.01)**
Gender of HH Respondent	-0.00822 (0.57)	0.0782 (0.01)	-0.0013 (0.98)	-0.0133 (0.56)
Gender x Radio			**0.029 (0.07)**	
Number of children	-0.0140 (0.00)	0.0222 (0.00)	0.010 (0.24)	0.00461 (0.26)
Children x Radio			**0.005 (0.05)**	
Number of children aged 0 – 5	0.0137 (0.01)	0.0246 (0.02)	0.024 (0.02)	0.00378 (0.65)
Elementary Education – Respondent	0.0391 (0.00)	0.135 (0.00)	0.134 (0.00)	-0.00364 (0.81)
Secondary Education – Respondent	0.0324 (0.04)	0.244 (0.00)	0.243 (0.00)	0.0272 (0.30)
Higher Education – Respondent	0.0744 (0.01)	0.342 (0.00)	0.338 (0.00)	0.0184 (0.77)
Number of adults	-0.0109 (0.01)	0.0107 (0.09)	0.011 (0.08)	0.00289 (0.57)
Number aged over 60	-0.00607 (0.67)	-0.0929 (0.00)	-0.091 (0.00)	-0.0147 (0.42)
Owns a TV	-0.00889 (0.67)	0.0699 (0.04)	0.067 (0.04)	0.00198 (0.95)
Owns a mobile	-0.00455 (0.75)	0.0720 (0.00)	0.073 (0.00)	0.0631 (0.00)
Observations	3736	3736	3736	3693
Adj. R^2	0.04	0.18	0.18	0.05

Note: Base specifications, p-values as in Table 4, plus control for health worker visit for malaria discussion. The third column also controls for the indicated interaction terms. Health worker visit and other coefficients not reported; among them, only the income and wealth variables are generally positively and significantly associated with knowledge of ORS.

These effects, however, are entirely conditional on access to radio. The third column reports results from interacting the radio access variable with the gender of the respondent and the number of children in the household. Female respondents with no access to radio are no more likely to know about ORS treatment; nor are households with children. However, among respondents in which the household respondent is female and the household has the median number of children (two), an increase in the number of community radio stations from zero to the median (two) leads to a 4.4 percentage point increase in the fraction of respondents who respond correctly to the ORS question; 48 percent of all respondents answered this question correctly.

Another survey question, which is likely correlated with household knowledge of good health practices, relates to awareness of the rates of child mortality. Greater knowledge of child mortality rates may be especially correlated with health messages related to malaria and the efficacy of bed-nets, given that this disease is one of the leading causes of death among children before they reach their fifth birthday. Respondents were asked to give a ball-park estimate of child mortality rates in Benin—around how many among any 100 children born in Benin would not survive beyond the age of five. Only 15 percent of respondents correctly answered with the right range (based on national statistics). The last column in Table 5 shows that village radio access has a significant positive effect on correctly identifying the range of child mortality rates in Benin. These results are consistent with media effects on household knowledge of health practices and outcomes, which would account for the estimated reduced-form effect of media access on household private investment in anti-malaria bed nets.

Robustness

The results in Table 4 are robust to a large number of other specifications. First, the estimates are based on household observations. They are clustered and therefore not assumed to have independently-distributed errors at the village level. However, since bed net distribution could be focused on villages, and radio access varies by village, the village could be the more appropriate unit of observation.

Table 6 reports the results of estimating equation (1) at the village level. The survey includes information on village level characteristics that might affect the availability of bed nets, in addition to radio access: the distance of the village to the nearest urban center or to the nearest bus or train stop; the number of new potable water sources in the village and whether the village has a paved road; the number of functional private schools; whether the village has access to a literacy center of health/maternity center; the level of education of the village chief. All of these are controlled for. The village population comes from census data. Unfortunately, the census has no income data at the village level. We therefore average village responses to the income and housing quality questions and control for these averages. Finally, in a linguistically diverse country, linguistic heterogeneity could affect access to bed nets. We control for two variables, again based on household responses to the survey: whether the main village language and the main commune language are the same; and the probability that any two households in the village sample speak the same language.

The estimates in Table 6 reinforce the results presented in Table 4: radio access increases both the willingness of households to pay for bed nets and the diversion of potentially free bed nets into the paid market. As before, access to community radio has no significant effect on the total number of bed nets and a negative, insignificant effect on the number of free bed nets reported by households. In contrast, again as in the earlier estimates, radio access leads households to acquire a significantly larger number of paid government bed nets.

Table 6: Village radio access and total village bed nets

Dependent variable:	Total bed nets	Free Gov't bed nets	Paid Gov't bed nets	Total pre-treated bed nets	Free Gov't pre-treated	Paid Gov't pre-treated
Non-commercial private stations	**0.924**	**-0.766**	**1.690**	**1.227**	**-0.465**	**1.692**
	(0.36)	**(0.28)**	**(0.07)**	**(0.21)**	**(0.55)**	**(0.02)**
Public stations	-3.843	-2.524	-1.319	-2.052	-1.900	-0.152
	(0.10)	(0.13)	(0.50)	(0.29)	(0.24)	(0.92)
Commercial private stations	2.046	0.984	1.061	0.298	0.574	-0.275
	(0.04)	(0.28)	(0.31)	(0.81)	(0.63)	(0.73)
Religious stations	0.0890	0.486	-0.397	-0.128	0.488	-0.616
	(0.96)	(0.78)	(0.82)	(0.95)	(0.79)	(0.68)
Distance to closest urban center	-0.0433	0.00834	-0.0517	-0.0233	0.00149	-0.0248
	(0.24)	(0.78)	(0.05)	(0.55)	(0.96)	(0.26)
Distance to closest bus/train stop	0.139	0.117	0.0217	0.137	0.124	0.0132
	(0.00)	(0.00)	(0.49)	(0.00)	(0.00)	(0.60)
# functional private schools	-4.923	0.148	-5.071	-3.688	-1.159	-2.529
	(0.05)	(0.95)	(0.06)	(0.12)	(0.69)	(0.17)
Literacy center in village	1.497	3.241	-1.745	3.293	3.664	-0.371
	(0.46)	(0.03)	(0.23)	(0.09)	(0.02)	(0.79)
Health or maternity center in village	-0.406	-1.023	0.617	-1.291	-1.337	0.0456
	(0.83)	(0.49)	(0.65)	(0.51)	(0.40)	(0.97)
Village Chief with Secondary Education	5.291	3.618	1.673	4.712	3.389	1.323
	(0.02)	(0.01)	(0.37)	(0.02)	(0.02)	(0.41)
Average > 45K CFA income	-9.606	-5.476	-4.129	-3.114	-4.505	1.391
	(0.05)	(0.37)	(0.43)	(0.71)	(0.59)	(0.76)
Average brick walls	6.638	7.564	-0.926	12.52	10.67	1.853
	(0.27)	(0.14)	(0.90)	(0.03)	(0.04)	(0.74)
Average with more than 5 rooms	30.71	11.06	19.65	7.363	2.099	5.264
	(0.00)	(0.15)	(0.00)	(0.58)	(0.86)	(0.32)
Average with own TV	24.40	8.357	16.04	10.16	2.004	8.156
	(0.00)	(0.29)	(0.10)	(0.25)	(0.78)	(0.30)
Average number of HH adults	1.689	1.547	0.143	2.880	2.546	0.334
	(0.26)	(0.25)	(0.91)	(0.02)	(0.10)	(0.74)
Average number of HH children	2.539	1.384	1.155	2.708	1.344	1.364
	(0.01)	(0.08)	(0.18)	(0.00)	(0.11)	(0.08)
Observations	199	199	199	199	199	199
Adj. R^2	0.58	0.46	0.36	0.39	0.33	0.37

Note: Observations are village-level averages. Estimates based on ordinary least squares controlling for commune fixed effects. Robust *p*-values clustered on communes in parentheses. Coefficient estimates of the following controls are insignificant and not reported: village population; presence of a paved road in village; no. of potable water sources built in

2007-08; primary education of village chief; average number of respondents who report income less than 27.5 thousand CFA francs; mean no. of respondents who report cement floors; mean no. of respondents with mobile phones; whether most common language is the same in village and commune; the probability that any two households speak the same language in the home; average number of adults over 60; and the average number of children under five.

Proximity to a bus stop has a significant positive association with the number of treated government bed nets in the village, consistent with the possibility that government efforts to disseminate bed nets are sensitive to the cost of reaching those households. The presence of a literacy center, but not a health center, is associated with more treated government nets, but with no other kind of net. Results from the fourth specification indicate that villages that lack private schools and are further from urban centers are less likely to acquire untreated government nets.

Table 7 summarizes the results of a number of other robustness tests. First, radio access should influence not only the number, but also the share of government and own-acquired bed nets. The first row of Table 7 shows that results are robust to substituting the share of different categories of bed nets for the absolute numbers, as in Table 4. Radio continues to have a significant positive impact on the share of own-acquired bed nets, treated or not (the effect on the share of government bed nets is, by construction, the negative of this). It is also possible that the effects of radio access should be properly viewed as influencing whether households acquire any bed nets at all. Results are unchanged after substituting dichotomous variables for the number of bed nets, as in Table 4, and using a logit specification with commune fixed effects (results not reported).

The identification strategy of the paper ensures that variations in radio access are exogenous, but this may not be the case for other independent variables in the specification in Table 4, potentially injecting bias into all of the estimated coefficients. The second row of Table 4 presents the results of regressions that control only for the (exogenous) radio variables and commune fixed effects. The estimated effects of private non-commercial radio on own-acquired bed nets are larger; government-sourced bed nets continue to be insignificantly or negatively influenced by radio access.

A key part of public health policy in Benin, as in other poor countries, is outreach by health workers. The survey asked respondents if they had received a visit by a health worker to discuss malaria. These visits are common: 41 percent of respondents report that a health worker called on their household. While these visits are not predicted by any of the determinants of bed nets in Table 4, including radio access, their omission from Table 4 specifications may be a source of bias. The third row of Table 8 reports estimates of radio access based on the Table 4 specification, supplemented with a dichotomous variable indicating whether households received such a visit. Health worker visits have a significant, large and positive correlation with the number of free government bed nets received by the household, but no correlation with own-acquired bed nets (not reported), suggesting that these visits are associated with the actual delivery of bed nets as part of government bed net campaigns. Controlling for these visits has no effect on the estimated effects of radio access on bed net acquisition using own resources.

The estimates in Table 4 ignore the possible interdependence of demand for government and own-investment in bed nets. The fourth and fifth rows of Table 7 present results of specifications that take these effects into account. The fourth row takes a naïve approach to this issue and looks only at the sub-sample of households that should have the strongest demand for own investments in bed nets – those who receive no free government bed nets at all. The magnitude of the effect of community radio access is larger here than in Table 4, as one would expect. An alternative approach, controlling for the number of government bed nets in the own-acquired bed net specification, yields the same result: the more free government bed nets a

household has, the fewer bed nets it acquires using own resources (every additional government bed net is associated with .21 fewer non-government bed nets).

Table 7: Robustness checks: Coefficient on number of community radios with different specifications/samples

Dependent variable, number of:	Free gov't bed nets	Paid gov't bed nets	Treated, free gov't bed nets	Treated paid gov't bed nets
Specification change:				
Share of column's bed net category in HH's total bed nets	-0.018 (0.08)	0.018 (0.02)	-0.022 (0.03)	0.020 (0.03)
Only radio controls and commune Fes	-0.045 (0.093)	0.073 (0.001)	-0.035 (0.227)	0.067 (.002)
Add control for health worker visits to discuss malaria	-0.038 (0.18)	0.054 (0.021)	-0.028 (0.39)	0.052 (0.015)
Include only 1,160 HHs with no government bed nets	NA	0.13 (0.01)	NA	0.108 (0.006)
Jointly estimate govt./own-acquired with Seemingly Unrelated Regressions	-.041 (0.095)	0.054 (0.001)	-0.031 (0.209)	0.051 (0.001)
Include only HHs in villages lacking paved roads	-0.040 (0.167)	0.049 (0.048)	-0.030 (0.354)	0.046 (0.034)
Exclude 25 percent of sample closest to urban center	-0.066 (0.053)	0.053 (0.043)	-0.058 (0.088)	0.049 (0.057)
Exclude 25 percent of sample furthest from urban center	-.013 (0.691)	0.061 (0.014)	-0.007 (0.855)	0.059 (0.011)
Separately estimated effects of community radios inside and outside of commune. Coefficients (from the same regression) of:				
Stations inside commune	-0.297 (0.023)	0.182 (0.056)	-0.275 (0.057)	0.205 (0.015)
Stations outside commune	-0.006 (0.860)	0.058 (0.023)	-0.0002 (0.995)	0.055 (0.019)

Note: Each coefficient is the estimated effect of the number of community radios on the indicated dependent variable, from the corresponding specification of Table 4, as modified according to the indication in the first column above. In the last two rows, the number of community radio stations in the specification of Table 4 is replaced with two variables: the number of stations broadcasting from inside the commune and the number from outside. Both coefficients from the corresponding regression are reported.

The fifth row explicitly allows for the possibility that unobserved household characteristics simultaneously influence household access to free government nets and private investments in bed nets. Seemingly-unrelated regressions (SUR) correct for this possibility, allowing for the error terms across the government and own-acquired bed nets regressions to be correlated. Estimating equation (1) using SUR again yields a significant effect of access to community radio on the acquisition of bed nets using own resources.

The next three rows look at sub-samples that are more homogeneous with regard to remoteness. The sixth row examines only villages that lack a paved road. The seventh excludes the 25 percent of the sample that is nearest to a bus stop and the eighth excludes the 25 percent that is furthest away. Again, the results mimic those in Table 4; access to non-commercial private radio has a strong, positive effect on the number of own-acquired bed nets that households report.

The specifications in Table 4 include all community radios to which villages have access, both within and outside their commune. Given the small size of community radio stations and the way in which the sample of villages was selected, village access to both types of radio stations is likely to be exogenous. The arguments underlying identification are strongest, however, for within-commune variation in village access to out of-commune radio stations. An important robustness issue is therefore whether the main results of the paper – the lack of effect of radio access on the number of free bed nets and the positive effect on the number of paid government bed nets – are robust to looking at within- and out-of-commune stations separately. The last two rows of Table 7 therefore examine a specification in which the number of out-of-commune and of within-commune stations replace the single community radio variable in the Table 4 specification. As in Table 4, access to out-of-commune stations has a highly significant positive effect on the number of paid government bed nets households report and no effect on the number of free bed nets; coefficient magnitudes are about the same as those in Table 4.

Many of the robustness specifications yield a significant negative estimate of the effect of radio access on the number of free bed nets that households report, consistent with the argument that the diversion of free bed nets to paid markets is higher where demand is greater. Consistent with this argument, the effect is most marked for within-commune community radio stations in the last two rows of Table 7.

7. Conclusion

Previous studies in a fast-growing literature on the role of media and information in government accountability show a strong relationship in mature democracies between access to media and to government transfers. In contrast, based on a novel policy and institutional context, and using a new identification strategy, our results demonstrate that media may not affect government responsiveness in younger democracies where political support rests on clientelist promises to voters. In environments such as Benin's, where political parties and other vehicles for citizen collective action are weak, greater radio access has no influence on whether they receive free government bed nets.

However, in a contribution to another burgeoning line of research focused on the marketing and pricing of public health products in poor countries, we find significant effects of media access on the number of paid bed nets that households report. In earlier work, Keefer and Khemani (2010) also show that radio access increased household investment in children's education. However, the results in the analysis here point to an important and previously unobserved interaction between marketing and pricing strategies in countries with weak institutions: marketing

efforts to encourage households to take advantage of government health products seem to lead to the diversion of those products from potentially free into paid markets.

An additional contribution of this study is to increase our understanding of the mechanisms through which media access influences policy outcomes. All theories agree that media access matters because it increases the transmission of relevant information to households, better enabling them to hold government accountable or to make appropriate decisions regarding health, education or simply the take-up of government policies. With the exception of research by Snyder and Strömberg (2011) using US data, earlier researchers could not confirm both that media actually broadcast relevant information and that media affected respondent knowledge. The data from Benin fill both of these gaps.

They confirm that radios do broadcast information on health and, specifically, malaria. Moreover, these broadcasts are relevant both for accountability (the existence and timing of free bed net distribution) and household behavior (the importance of using bed nets). Nevertheless, consistent with the reduced-form estimations that find no effect of radio access on government accountability and a significant effect on household behavior, radio access has similarly little effect on knowledge relevant for government accountability, namely, government health policies. Instead, access has significant effects on knowledge relevant for private household health practices.

The data do not allow for an evaluation of the welfare consequences of the diversion of bed nets to the paid market. First, they do not reveal whether local officials use bed net payments to subsidize other health interventions provided by health centers, or for private purposes. Second, they do not indicate whether households that pay for bed nets are more or less vulnerable to malaria compared to households that would have received the bed nets for free. Third, we cannot measure the effects of media on how households utilize the nets – better utilization may offset any welfare losses due to the effects of pricing on how bed nets are distributed across households.

The literature reviewed earlier yields mixed evidence on whether the shift from free to paid bed nets and other health products increases their appropriate use by households most in need of them. The diversion of free bed nets to the paid market may therefore have no significant impact on how they are used nor on who uses them. If this is the case, the results here suggest that the main impact of media coverage of malaria and malaria prevention may be to reduce the consumer surplus of households while either increasing the welfare of households that receive health care subsidized by bed net payments or increasing the welfare of local officials who retain the payments received from the sale of bed nets that they would otherwise have had to distribute for free.

The results point to the need for caution in combining supply- and demand-side interventions to improve health practices in poor countries with weak institutions. On the one hand, access to media offers no guarantee that citizens will be able to hold governments accountable for the quality of public policies in environments where constraints to political responsiveness are more substantial. On the other hand, radio access can have a substantial positive effect on private household health behavior, provided that the stations broadcast relevant programming about the importance of health practices. However, government officials can moderate their strategies for distributing health benefits in response to changes in household demand; the potential endogeneity of distribution strategies to marketing efforts is a key issue that policy makers should bear in mind.

Our analysis examines only the effects of media access and does not test the efficacy of concerted efforts to broadcast programming that encourages citizens to increase government responsiveness. Evidence from Brazil suggests that greater access to radio played a facilitating role in reducing local government corruption during a campaign of public disclosure of audit findings of

irregularities in municipal government spending (Ferraz and Finan, 2008)). Tendler (1997) describes how a reform-minded state governor in Brazil successfully used radio broadcasts to spread messages that undercut municipal patronage politics and increased citizen demand for municipal public health services. An open question for future research on accountability interventions in more clientelist democracies is, therefore, whether accountability programming can be tailored to local political contexts to strengthen political incentives for service delivery.

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